

annually nominated by the Council and appointed by the General Committee for the purpose of considering these applications, as well as for that of keeping themselves generally informed of the annual work of the Corresponding Societies, and of superintending the preparation of a list of the papers published by them. This Committee shall make an annual report to the General Committee, and shall suggest such additions or changes in the List of Corresponding Societies as they may think desirable.

"(4) Every Corresponding Society shall return each year, on or before June 1, to the Secretary of the Association, a schedule, properly filled up, which will be issued by the Secretary of the Association, and which will contain a request for such particulars with regard to the Society as may be required for the information of the Corresponding Societies Committee.

"(5) There shall be inserted in the Annual Report of the Association a list, in an abbreviated form, of the papers published by the Corresponding Societies during the past twelve months, which contain the results of the local scientific work conducted by them; those papers only being included which refer to subjects coming under the cognisance of one or other of the various sections of the Association.

"(6) A Corresponding Society shall have the right to nominate any one of its members, who is also a member of the Association, as its delegate to the annual meeting of the Association, who shall be for the time a member of the General Committee.

"Conference of Delegates of Corresponding Societies"

"(7) The Delegates of the various Corresponding Societies shall constitute a Conference, of which the Chairman, Vice-Chairmen, and Secretaries shall be annually nominated by the Council, and appointed by the General Committee, and of which the members of the Corresponding Societies Committee shall be *ex officio* members.

"The Conference of Delegates shall be summoned by the Secretaries to hold one or more meetings during each annual meeting of the Association, and shall be empowered to invite any member or associate to take part in the meetings.

"The Secretaries of each Section shall be instructed to transmit to the Secretaries of the Conference of Delegates copies of any recommendations forwarded by the Presidents of Sections to the Committee of Recommendations bearing upon matters in which the co-operation of Corresponding Societies is desired; and the Secretaries of the Conference of Delegates shall invite the authors of these recommendations to attend the meetings of the Conference and give verbal explanations of their objects and of the precise way in which they would desire to have them carried into effect.

"It will be the duty of the Delegates to make themselves familiar with the purport of the several recommendations brought before the Conference, in order that they and others who take part in the meetings may be able to bring those recommendations clearly and favourably before their respective Societies. The Conference may also discuss propositions bearing on the promotion of more systematic observation and plans of operation, and of greater uniformity in the mode of publishing results."

UNDERGROUND NOISES HEARD AT CAÏMAN-BRAC, CARRIBEAN SEA, ON AUGUST 26, 1883

THE following letter describes certain underground noises heard on the day of the great eruption of Krakatoa, in a little island of the Carribean Sea, very near the antipodes of the Sunda Strait. It is possibly an interesting instance of propagation of sound through the whole diameter of the earth. I shall first translate the

letter of my correspondent, then add some explanatory remarks:—

"South of Cuba, in 80° long. W., and 20° lat. N., the three little islands, Great Caïman, Little Caïman, and Caïman-Brac, are inhabited by a population of tortoise fishermen; there are also a life-boat station and Lloyd's agent. These islands are indeed in the path of the great cyclones of the Antilles, and they witness many shipwrecks.

"In the month of September 1883, as I was in the island Utila, near the coast of Honduras, we heard the first news of the great eruptions of Krakatoa, and talking about those tremendous cataclysms, I met Capt. Robert Woodville, who had just received a letter from the Caïmans; he told me what follows:—

"On Sunday, August 26, the inhabitants of Caïman-Brac were astonished by a noise like the rolling of a distant thunderstorm; the sky was fine, and they at first thought it was a skirmish between a Spanish cruiser and some Cuban smugglers. On the south side of the island nothing was to be seen; they ran across the island, and northward all was quiet too; no smoke nor ship was in sight. The cannonade still continued, and going back again they recognised that the noise came from underground. They were much afraid, and expected their island would soon subside in the sea, or be turned into a volcano. By degrees the detonations ceased, and their fears were quieted. But the phenomenon was not forgotten, and was still talked about when the first news of the Krakatoa eruption came. They made the remark that the Caïmans and Sunda Strait are nearly at the antipodes of each other, and the hypothesis of a correlation between the two phenomena was propounded. . . .

"(Signed) EDMUND ROULET"

I will not be too sanguine, and accept without criticism so abnormal a fact of the propagation of underground sounds from Krakatoa to the Caïmans through the whole mass of the globe; but I will try to show the reasons which tell in favour of such a bold hypothesis, and lead me to accept it provisionally. There are, it seems to me, plausible grounds for admitting that the subterranean noises heard at the Caïmans were the repercussion of the explosions of the great Krakatoa eruption:—

(1) These noises heard at the Caïmans did not come from one of the numerous volcanoes of Central America: if a great eruption had been known on the same day, the inhabitants of Caïman-Brac and Utila would have found out for themselves the co-relation between the two phenomena. From the nineteenth catalogue of C. W. C. Fuchs (*Mineral. Mitth. v. Tschermak*, vi. 185, 1884) we know of the following eruptions which happened in the summer of 1883. The Cmotepac, an insular volcano in the middle of the lake Nicaragua, was in eruption on June 19, opening a new crater, and giving way to abundant lava streams; in the month of August the lavas were still burning. Cotopaxi (in the State of Ecuador) had at the end of August (the exact time is not given) a short, but very strong eruption, accompanied by violent earthquakes. I cannot, however, believe that a great eruption, with noises audible at a distance of 1100 to 2300 kilometres, would not have been better noted, if it had taken place on the same day as the great eruption of Krakatoa. This last event has been enough talked about over the whole world to call attention to such a coincidence if it had really existed.

(2) As to the explanation of the Caïman noises by an unnoticed submarine eruption in the vicinity, I have only to state that the great Antilles are not a volcanic region: the nearest volcanic regions are the Little Antilles and the west coast of Central America, both which are too far to allow such an interpretation of the noises heard at the Caïmans.

(3) The great eruption of Krakatoa on August 26 and 27, 1883, was accompanied by subterranean noises which were always described as resembling the rolling of cannon or of thunderstorm. The description from the Sunda Islands does not differ from that from Caïman-Brac.

(4) The subterranean sounds of the Krakatoa eruption have had an enormous intensity, and have been detected at a distance never heard of before. As is well known (*vide* NATURE, vol. xxx. p. 10), the explosions were heard over a circle of 30° radius, *i.e.* 3300 kilometres. It is indeed only the quarter of the length of the earth's diameter; if the hypothesis is true, we would have here a considerable extension of the propagation of the sound through the earth.

(5) Caïman-Brac lies very near the antipodes of Krakatoa. The exact position of Krakatoa is $105^\circ 30'$ E. long. and 6° S. lat.; Caïman-Brac, $79^\circ 30'$ W. long. and $19^\circ 30'$ N. lat. The antipodes of Krakatoa is also $4^\circ 30'$ more towards east, and $13^\circ 30'$ more towards south; it is in the middle of the United States of Colombia, on the Magdalena River, between the towns Antioquia and Tunja.

(6) The time at which the noises have been heard at Caïman-Brac corresponds sufficiently to what we know about the time of the eruption of Krakatoa. From the report of R. D. M. Verbeek (NATURE, vol. xxx. p. 10) the explosions of the volcano have been noticed in the Sunda Islands on August 26 and 27, and especially on the morning of the 27th. The noise reached its maximum at Buitenzorg on the 27th at 6.45 a.m.; at Batavia at 8.30; and at Telok-Betong at 10 o'clock. From the difference of longitude August 27, 8.30 a.m. at Batavia is the same time as August 26, 8.5 p.m. at Caïman-Brac. If we admit that the propagation of the sound through the 12,000 kilometres of the earth's diameter would take about one hour, the maximum detonations must have reached the Caïmans on August 26 at 9 p.m. Unfortunately the letter of Mr. Roulet does not give us the exact time of day at which the sounds were heard at Caïman-Brac; I have asked my correspondent to complete, if possible, his observation on that point.

I do not wait for the reply before publishing the present communication for the following reasons:—I believe it is very important to call attention without further delay to this fact, and to beg of the inhabitants of the coast and the islands of the Carribean Sea to collect all that can be remembered about these events; perhaps they heard also the noises described at the Caïmans, and they can confirm, or complete, or correct the observation given by Capt. Woodville.

In case the correlation between the noises at Caïman-Brac and the Krakatoa eruption would be ascertained, it would be a fact of uncommon interest which would equal and surpass the other astonishing phenomena to which the cataclysm of the Sunda Strait gave rise: the transmission of the atmospheric waves to the barometers of the whole earth, the propagation of the marine waves to the maregraphs of Europe and America, the crepuscular and auroral glows of the autumn of 1883, the solar corona of 1884 (which is still apparent, and can be observed every day in February and March, 1885), the abnormal polarisation of the sky (A. Cornu), &c., &c. F. A. FOREL.

Morges, Switzerland, March 8

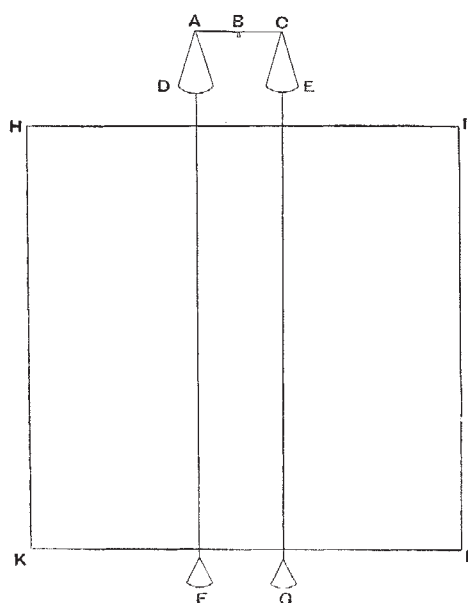
REMARKS ON OUR METHOD OF DETERMINING THE MEAN DENSITY OF THE EARTH

IN NATURE for March 5 (p. 408) Prof. Mayer suggests an improvement in our method of determining the mean density of the earth, from which it appears that our plan has not been properly understood. This misunderstanding, no doubt, has arisen from the incomplete description

of our method given in the NATURE (Jan. 15, p. 260) report of the *Proceedings* of the Berlin Physical Society, which report was probably the only source of information accessible to Prof. Mayer. We are led therefore to give a short description of our method.

Let HIKL represent a section of a cubical block of lead, about two metres in the edge, and weighing 100,000 kilos. The balance ΔBEC is placed in the middle of the upper horizontal surface. It bears the scale-pans D and E. Under these scale-pans the block is bored vertically through, and two other scale-pans, F and G, are suspended below the block, attached to the balance by means of rods passing through these openings.

A weight in D is brought into equilibrium by weights in G. The weight in D is acted upon by the earth's attraction + that of the block, and that in G by the earth's attraction — that of the block. The weights in G are then greater than that in D by twice the attraction of the block. The weight in D is now removed to F and counter-balanced by weights in E. The weight in E will be less than that in F by twice the attraction of the block. The difference of the two weighings gives therefore four



times the attraction of the block. A correction must be introduced for the variation in the earth's attraction due to the different heights of D, E, and F, G.

In order to obtain as great a deflection of the balance by the method suggested by Prof. Mayer, each of the mercury spheres must exert the same attraction as our lead block. This would require spheres having radii of about one metre. The length of the beam of the balance would be necessarily at least two metres. Besides each mass of mercury would exert some attraction on the weight on the other side, and thus lessen the deviation of the balance.

The method given by Prof. Mayer, except for the suggested employment of mercury, is then no improvement on ours. If we should use mercury, we would construct a cubical vessel to contain it, and use it as we propose to use the lead block. The advantage of using mercury is, however, counterbalanced by the difficulty of obtaining it in such large quantities as would be necessary.

ARTHUR KÖNIG
FRANZ RICHARZ

Berlin, Physical Institute of the University,
March 15